Center Innovation Fund: SSC CIF

Prototype Application of Portable Augmented Reality Technology for Enhancement of Space and Planetary Exploration

Completed Technology Project (2012 - 2012)

Project Introduction

Due to a lack of atmosphere and lighting, ascertaining location and distance of features on the lunar surface is extremely difficult. Because of these issues, developing a capability that addresses the need to identify features remotely would be beneficial for future lunar and planetary surface studies. This project investigated using the latest augmented reality (AR) techniques, with commercially-off-the-shelf (COTS) available AR software, for locating distant ground articles through an augmented live view. Methods for properly geolocating articles of interest and augmenting information and/or 3-D representations of them accurately in virtual space around the user were investigated. To accomplish this, smart tablets equipped with AR software were used to test for both potential uses for accurate AR tracking/location and for ease of development; the results demonstrated a proof-of-concept with potential for future use as a planetary feature locator tool.

For this project, several different augmentation techniques for locating ground articles from distance through an augmented live view were investigated. Article photo-recognition, printed AR target on articles recognition, and geotagging augmented reality techniques were tested for accurate AR tracking, location, and ease of development. Also, an innovative use of combined virtual reality (VR) panorama elements along with properly placed AR elements in the virtual scene was tested for accuracy and ergonomic field viewing via the smart device. Test cases were run at SSC with: (1) common above and underground facilities; and (2) at a long barren sandy test site, with various application/techniques to determine feasibility of potential use for extra-planetary AR location/identification. Tests were first run at close range and then, if those runs were successful, they were additionally run at a distance.

Anticipated Benefits

Benefits to NASA funded missions include the ability to rapidly access site Product Lifestyle Management (PLM) database information and product management from AR tagged or Point of Interest (POI) geolocated system areas. Enabling access to this type of information would enhance user capabilities, for example, in the areas of safety, Quality Control (QC), inventory, and system engineering management, as well as for use in or at base operations for planetary exploration.

Benefits to NASA unfunded missions and planned missions include providing the potential to enhance existing AR applications/tools so that a more robust multi-scale, multi-distance performance could be implemented, and/or based on findings, create future custom applications that could be used for testing these AR tools in lunar/planetary analog locations.

Benefits to the commercial space industry would be similar to those that would benefit NASA. AR tools developed that are enhanced with real-world views

Logo for the Office of the Chief Technologist

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

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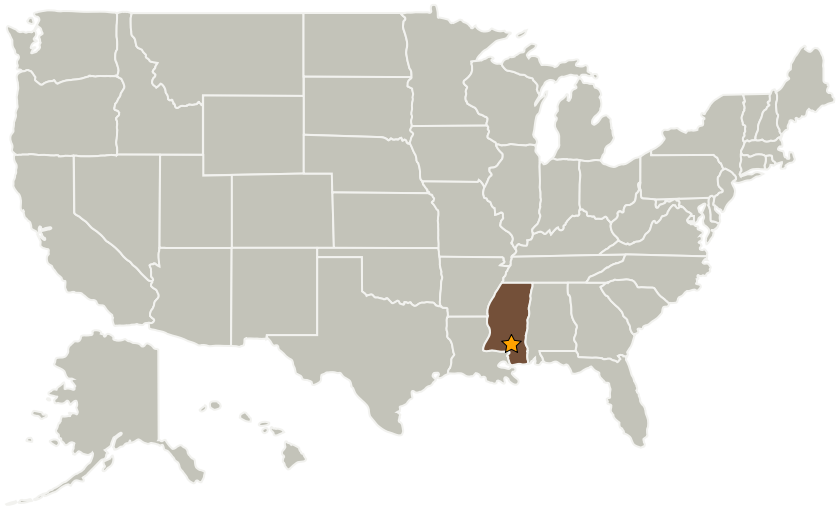
would help improve their ability to detect and recognize features and provide improved detection and identification information.

Benefits to other government agencies (i.e. DARPA, DoD, DHS, Army, and Navy) would be similar to those that would benefit NASA. AR development systems that are combined with geolocation tools offer enhanced graphical capabilities and potentially the opportunity to provide more robust information for ground articles.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi

Primary U.S. Work Locations
Mississippi

Project Management

Program Director:
Michael R Lapointe

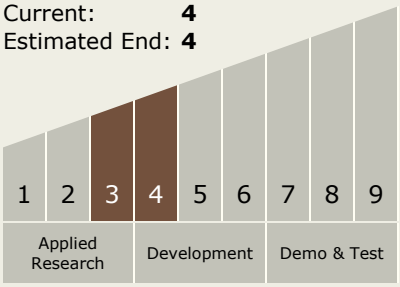
Program Manager:
Ramona E Travis

Project Manager:
Casey S Wheeler

Principal Investigator:
Richard B Brown

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.2 Modeling
    - TX11.2.3 Human-System Performance Modeling

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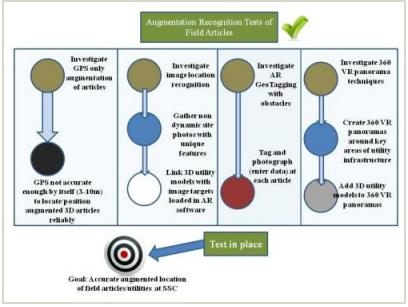
Images

Office of the Chief Technlogist
Logo for the Office of the Chief Technologist
(https://techport.nasa.gov/image/4068)



Prototype Application of Portable Augmented Reality Technology for Enhancement of Space and Planetary Exploration Project
Augmentation Recognition Tests of Field Articles
(https://techport.nasa.gov/image/4230)